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THE DISTRIBUTION OF CONSCIOUSNESS AND ITS CRITERIA

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I

The field of psychology is by definition the system of phenomena which mental life presents. Its aim is to characterize these phenomena and formulate their laws under the ideal of a unitary system within which all descriptive and explanatory concepts shall finally be congruous with one another.

Materials for the psychologist's study are primarily afforded by the facts of his own immediate experience. But this field provides only the starting-point of his general inquiry, which at once carries him across the boundaries of his own mental life into a larger kingdom of minds. For this extension of the field there are at least two reasons. The first is methodological and results from the significance of the observer's attitude in psychological investigation. In order to study the mental content or activity in an unmodified form and under its natural conditions the mind must, so far as possible, be relieved of all other interests and responsibilities at the moment. Its participation in the conduct of the experiment,—such as the immediate control of conditions and presentation of the stimulus— and in the making and checking of records, should be reduced to a minimum. Among these modifying elements none is more significant than the attitude of the subject toward his own experience and its psychological significance; so that, in general, it is equally necessary to avoid an emotional self-consciousness and a reflectively critical atti-

tude on the part of the observer. In many cases this can be secured only when the subject is in ignorance of the nature of the problem under investigation, and of the bearing of his own observation upon its solution. The conditions of experimentation have therefore made it the general practice of the psychologist to seek the assistance of an observer who is both freed from all care of what may be called instrumentation, and kept in an attitude of naïve or primary attention to the observation to be made. This first consideration, therefore, concerns only the difficulties of manipulation when the subject is called upon to control the conditions of his own observation.

The second reason for extending the materials of psychological study beyond the primary field of self-observation springs from the aim of the science itself. For its interest does not terminate with a scrutiny of the subject's own mind as individual and unique. That mind is indeed sufficient in itself to afford a field for psychological study, as various classical researches have shown; for it presents a complex system of correlated phenomena providing problems both of characterization and of explanation. But like all natural sciences psychology looks beyond the individual to series and types; and the object of the psychologist's study is a kingdom of minds to which his own belongs merely as one out of many. These minds are not identical in their forms and modes of activity. They vary individually and fall into groups according to their likenesses and differences. To explore these various mental types and to set forth their characteristic features, to formulate their variations and arrange them as typical groups in an orderly classification is the work of descriptive psychology. It is not personal characterization or individual history but the common features and laws normal to a group of individual minds in which interest centers.

In all this work the psychologist is indeed not brought face to face with his materials. He must reconstruct the form of any function, and of the mental life at large, by the interpretation of series of physical changes,—words, gestures, acts and modifications in material objects. The physical events are all that he directly perceives; the minds themselves lie beyond his field of vision and are discernible only indirectly. This dramatic reconstruction in terms of a significant inner experience we make, of course, quite apart from any scientific interest; and psychology may be said simply to adopt the interpretative reconstruction which common sense has made on the basis of the purposeful system of activities connected with

the human body. It is a general predication of the relation which immediate experience presents. As my own bodily activities express my mental life in the sense of presenting specific correlations with its individual features, I interpret each individual movement of my neighbor's body in terms of a similar mental change.

Psychology thus avoids the metaphysical problem which a criticism of this process of interpretation raises. Mental life is postulated. The problem of real existence and its cognition is not raised. Yet the product of common-sense interpretation cannot be accepted uncritically as the basis of a psychological predication of the existence and range of consciousness. The procedure of common sense is loose; it applies no rigid criterion; it is not consistent in its successive attitudes. The range of significant inner life is now broadened and then restricted as purpose and sentiment change. In the course of these shiftings conflicting criteria are applied at different times, the same process being interpreted now in terms of purpose then in terms of mechanism. At one moment the whole order of nature is made the expression of a significant spirit, at another this form of interpretation is denied even to the subject's own acts.

Psychology cannot accept a principle so loosely applied as the basis of its treatment. Either nature is ensouled and every change occurring therein is expressive of an appreciative inner life, or it is not so. In the first case we are theoretically confronted with the task of formulating the psychology not only of men and brutes but of unicellular animals and plants, not only of living organisms but of inanimate objects and the earth as a whole; for under the assumption in question all these existences are part of that general field with which psychology deals, whether it be accessible to the application of technical methods or not. In our sentimental moods we do thus apply to all changes of nature the concept of a significant life, a life of function and purpose, of sensitivity and appreciation.

The problem, after all, cannot be wholly avoided. In those types whose affiliation with our own is evident and close the problem may not be raised, except in terms of the particular trait of which the physical datum is to be taken as evidence. But when the divergence has increased to a certain extent, when both habit and structure are materially different from our own, it is certain to arise. What limits shall we set to the distribution of mind? Which class of facts shall we accept as the indication of its presence?

To formulate this problem rationally we must approach it with an understanding of the criteria according to which mind is predicated in connection with other physical activities than our own bodies. The argument has been called an analogy; it may also perhaps be called an induction. The alliance of physical and mental we know directly in the case of our own minds and bodies. Each side here is immediately given. The parallelism is not indirectly verified but immediately intuited. Every change in the body is sensed; every intention, every feeling finds expression in a characteristic bodily modification. Nor is the connection a merely general association; it is a point by point correspondence which may be read from either side. Thus, if my meaning is expressed in words, this relation necessitates that my words should have meaning,—that is, the reproduction of the words in their proper order should be capable of reinstating the thought they originally expressed. One thus becomes able to read meaning into words as well as to express meaning through words. And so also with every other factor in this physical correlate of mind; each expression is a symbol for a certain mental content which may indirectly be reached through it.

Now in the physical world there is to be found alongside of the observer's body other similar bodies reproducing his own feature by feature and manifesting the same general system of functions. The body with its activities, in these other cases, is looked at from without. Its form and functions correspond in general with the observer's own. Concerning the question at issue regarding this physical organism the only ground for inference is immediate experience. Within that field falls one case in which such a system of activities is known to be more than physical change, namely, in the case of the observer's own body. This, however, is not one among a number which do not conform to its type; it is not an isolated case in a larger field, an exception to the rule. On the contrary, it is the sole case known to him, and the situation may be stated thus: Wherever consciousness is known to exist it is in correlation with a physical body and its changes. The one instance exhausts the universe of experience. If, then, in the only case in which the problem of physical and mental correlation is actually resolvable, the connection be found to exist it is logically to be predicated in all those other cases in which one of the two correlated factors is given. An appreciative inner life is therefore asserted in connection with the activities of all human bodies alike.

The system of physical activities which constitutes the basis

of inference in the case of other persons cannot of course be observed with any approach to the intimacy with which it is known in the case on our own bodies. Little of that complex manifold of outer and inner changes of which we are immediately aware is apparent to another observer. One cannot hope, then, by the inspection of such aspects as are discernible in another body to arrive at an adequate acquaintance with the correlated mental attitudes. Nevertheless the likeness is sufficient to warrant us in the general ascription of a mind which duplicates the main features of our own while departing from its type in a variety of particulars.

There is perhaps no one element of these bodily changes which we can call essential to the correlation in question,—such a physical activity that its absence would entail a denial of the mental correlate in the given case. To differ from our own body in specific points, we say, is not to lack a mind in its entirety but to possess a mind differing from our own in individual features. We make provision for a series of divergent types within the realm of minds.

Since the basis of interpretation in all cases is a system of physical changes, and the associated type of mind is conceived to be reflected in its characteristic forms, the mental system will vary correlatively with alterations in bodily structure and function. Now, in the case of the physical correlate there is presented a series of progressively diverging types which, without essential break, carries us forward to forms extremely unlike our own,—organisms in which every individual feature is altered, which present none of those special structures or activities upon which the interpretation of mental constitution in our fellow-men depends. Indeed the series may be carried continuously through the succession of organic types until we have lost all but the most general properties of living substance and are confronted,—for example in the world of plants—with forms and relations which afford almost no practicable ground of comparison with our own.

If the imputation of mental life, in either its specific or its generic characters, be dependent upon specialized activities or connected with forms of structure, that life manifestly cannot be attributed throughout this whole series of forms. We must formulate the special criteria upon which our attribution turns and seek to define the limits within which alone we apply this mode of interpretation. In considering the distribution of mind, however, there are two questions to be taken into account: the first touches our criterion of the possession of mental life at large; the second affects the evidence for the

existence of a conscious aspect in the case of any individual physical activity.

II

The problem of the extent of correlation between physical and mental changes is not met for the first time when the limits of human activity have been passed, nor even when the interpretation of expressive reactions on the part of other men is undertaken. The observer is confronted by it within the field of his own immediate activity, in the problem whether all bodily processes are accompanied by consciousness, and *per contra*, whether all these processes are subject to modification by consciousness. The latter question need not here be considered. The remaining problem presents three possibilities:—first, that the whole system of physiological changes is reflected in consciousness; second, that there are certain activities which as a class are always unconscious and others which likewise are characteristically accompanied by consciousness; and finally, that any individual process may now have a form of consciousness correlated with it and then lack such an accompaniment, according to the conditions under which it occurs.

The classical answer to this problem is that only one form of bodily activity is immediately connected with mind, namely that of the central nervous system; and that any other physical or physiological process must be mediated by nervous activity if it is to be represented in consciousness. But as the central nervous system is both geographically limited and protected against direct exposure to stimulation arising in the external world it does not, without supplementation, provide the basis for a representation either of the external world or of the organic changes occurring in the body at large; nor is it fitted to be a medium for the expression of mind either in terms of characteristic changes within the body which parallel the mental attitude, or of transformations wrought in the external world through its agency.

On the other hand, the nervous system is made co-extensive with the body by an intricate system of outgrowths which penetrate every part of the organism; and it is brought into relation with the external world through the system of end-organs attached to it. In its constitution also the nervous system represents the two relations in which the connections of mind and body are characteristically read: it comprises a sensory aspect which makes possible the representation of the series of special stimulations acting upon the end-organs

of sense in terms of central nervous change; and it comprises a motor aspect which makes possible the expression of the series of central changes in terms of muscular contraction. In this sense the central nervous mass has been called a projection system for the whole series of sensitive and mobile points comprised within the limits of the organism.

The nervous system thus stands in unique relations with the body as a whole. It has no such specific function as have stomach, lungs, heart and kidneys. It contributes no new physical characteristic to the body. It does not even form the necessary condition of discrimination and adaptive response. Its function is to be called general rather than specific. It co-ordinates and integrates the whole system of bodily activities; no organ or living tissue but is penetrated by its fibrils, no function or reaction which proceeds in independence of it. Touching every part of the organic system and reflecting both its sensitive and reactive aspects the nervous system is thus aptly constituted to function as the physical basis of consciousness, if we view the latter in terms of its correlation with the whole system of activities which the body manifests.

In order that consciousness shall be predicated under this conception there must finally be an activity within the nervous system, and such activity will be accompanied by a characteristic consciousness whatever its original cause. No other physical process, on the other hand, will ever be accompanied by consciousness unless it finally gives rise to some form of central nervous change. But as every part and function of the body is connected with the nervous system the necessary conditions are given for the reflection in consciousness of the state of activity in the body at large and of each specific change occurring within it. We cannot restrict the system of modifications thus represented to limits narrower than the total group of functions with whose structural basis the elements of the nervous system are interwoven, and must therefore say: the activities of the body as a whole are representable in consciousness, in the sense that a change occurring in any part of the body may produce a definite effect upon the consciousness of the moment.

On the other hand, if the possibility of an arrest of functional activity within the central nervous system be admitted, or an interruption of continuity between that system and the rest of the body, there will be no necessary representation in consciousness of any process occurring without its own immediate bounds. Whether, in that case, any individual change is to be represented in consciousness or not will depend upon

the functional integrity of its locus with the central nervous system at the moment. As conditions change it will now be represented and then not.

The whole systematic correspondence between mind and body will thus be thrown into doubt, since their relation depends upon the permeability of lines of connection between the central nervous system and the rest of the body. If these lines be closed, neither will the peripheral change affect the central nor will the central modify the peripheral,—neither will stimulation be reproduced in consciousness nor will mental attitudes find expression through muscular change.

In the interpretation of physical processes in terms of mind a question of validity is thus raised at the outset; it cannot be deferred until outlying types of organic life are reached. Even in our own bodies the situation is obscure, and it has only been at the close of a long and slow historical development that technical students have themselves adopted as their working hypothesis the concept of uniform correlation between mental and physical changes even in the relation of the central nervous system to the mind. In every case it is indeed rather the logic of the situation than specific evidence which determines our judgment in these matters. It is impossible to indicate the minute ramifications of that process of bodily change in which our mental attitudes find expression, and it is equally impossible to trace in consciousness the reflection of each element of that vast and subtle system of modifications occurring in the body as the result of physiological conditions and physical stimuli.

The fact that any individual change in the body may or may not be represented in the consciousness of the moment, according to circumstances, enormously complicates the situation by which the psychologist is confronted when he inquires concerning the distribution of mind; and out of it arises a series of special problems. The general question of representation in consciousness may be raised concerning any bodily activity whatsoever since modifications in the central nervous system are hidden from psychological observation, the data upon which interpretation proceeds being invariably peripheral in character. Nor is the range of ambiguity limited to the series of sense-impressions in their relation to central nervous activity. By a further complication the products of motor nervous activity themselves are subjected to doubt. These processes, which by assumption are the direct result of central nervous activity and are habitually accepted as the characteristic expression of mental attitudes, do not necessarily

occur in isolation from the activity of the central nervous system when their significance is thus questioned. Within that system itself a division between higher and lower is found necessary, the higher levels of nervous change alone,—those namely which depend upon the cerebral cortex itself—being conceived as the essential correlate of mental activity. If the motor reaction does not involve these higher centers it will then have no representation in consciousness.

The division of peripheral activities to which this conception gives rise does not present two separate groups depending upon different muscular tissues, the striped and unstriped for example. It is the same movement which is now conceived to involve cortical activity and then to proceed in independence of it. In this fact lies the peculiar difficulty of interpreting reactions in terms of their mental correlates. The physical datum bears all the characteristic marks of a consciously determined act. It is an adaptive response to the situation and objectively expresses intelligence and purpose. It may both present a high degree of complexity in itself and represent an external situation which is similarly complicated. Its form may be such as could result only from a long-continued process of training originally dependent upon high intelligence. To conceive such a reaction as occurring independently of consciousness at any stage of its history may thus be a matter of difficulty, and its proper interpretation is rendered still more complicated by this persistent tendency on the part of the observer.

The psychological significance of any act, as well as of any impression on a sense-organ, will thus depend upon its relation to the central nervous system, not in the sense of its general structural or functional connections but of the situation which exists at the moment between the peripheral process in question and functional activity in the highest parts of that system.

The evidence upon which judgment turns in such cases will be sought either in a determination of the relations in which the two processes stand, according to physiological or histological methods, or it will take the form of an objective interpretation depending upon the whole logical situation presented. The first of these alternatives is completely impracticable as an experimental means of settling the individual case, and its inferential application is excluded by our lack of knowledge concerning the actual neural conditions under which such continuity is or is not to be expected.

Thus in a series of special activities lying within the field

of normal adult experience the question of psychophysical correlation is already raised. Which process is reflected in consciousness, which is dependent upon consciousness, cannot be told on the basis of specific character in the physical activity involved. Both stimulus and reaction share in this ambiguous character. The impression on eye or ear may have no representation in consciousness if functional integrity with the central nervous mechanism be at the moment interrupted. Such breaks appear to be caused incessantly by the distribution of attention. Familiar impressions,—continuous or repeated sounds, contact with clothing, odors in the room in which one is at work—thus fail of representation. In sleep the connection is so far broken that the general system of sensory impressions is shut off from the cerebrum. Yet we know that these stimuli from the outer world may occasion changes in the dream content and thus be reflected in the sleeper's consciousness.

The question whether such connection may not be more widespread than is supposed throws this whole series of relations into doubt. The distribution of dream-consciousness is itself a case in point. That much of our sleep is pervaded by a mental concomitant none doubts, for the first moments of waking consciousness frequently retain images which have been carried over from dreams and the connection is thus established through memory. But the extent of this correlation and the connection in general which obtains between the physical changes occurring during sleep and activities of consciousness have as yet received only a speculative formulation.

III

Within this group of cases falls a large number of more or less exceptional forms of activity, as well as several types which are essentially normal and important. The exceptional cases are those which, in general, have been described as due to conditions of 'disaggregation' in the nervous system. They commonly occur only in connection with a definite and highly integrated form of consciousness. They involve complex conditions of reaction and complicated types of response. Frequently their forms are the result of secondary modifications of behavior and represent conventional modes of reaction. They therefore stand for consciousness in the most direct way and we call them, in the narrowest sense of the term, expressions of mental attitude. The occurrence of such responses as the use of the tongue in speech or the hand in writing, for example, is difficult to conceive apart from a mental

content of which the product is a specific expression. Yet the condition under which on some occasions these reactions occur raises the problem whether in fact the complex movement had such a conscious correlate or not. In the handling of objects with which the fingers accidentally come into contact while the mind is otherwise engaged, in automatic writing and mimetic movements, in the speech of one who answers in his sleep to a call or question, in the reading which one continues in the face of overpowering fatigue or drowsiness without, for a time, any awareness of meaning or movements, in the speech of hysterical subjects when a so-called secondary self has been evoked,—in all these cases certain similarities of condition exist and a common problem is raised.

These acts are the characteristic expression of our most highly developed forms of consciousness; but in all the cases in question special features exist which we interpret as marking its absence. The subject is in general unaffected by the changes occurring in the world about him, as in sleep; or he has no intention to perform the movement which takes the form of a voluntary act, nor remembrance of it after it has taken place, as in mechanical responses; or his whole significant consciousness seems otherwise engaged at the moment, as in automatic writing and the speech of secondary selves.

The problem of interpretation therefore arises in a special way in connection with all such cases. Shall we conceive the form of response so elaborated that by some provision within the nervous system the impression is drafted off into an adaptive reaction in a way which does not involve the central cortex at all, and that in consequence it is not conditioned or accompanied by consciousness? Or shall we say that a consciousness of both the condition of reaction and the form of response was there but never as the object of engrossing attention and irrecoverable in after-consciousness? Or shall we say, finally, that consciousness is not to be conceived as a unity, being the correlative of certain systematic activities within the nervous mass which do not necessarily involve the system as a whole but may constitute functionally independent and co-existing processes of response; and that a dissociation or disaggregation within the consciousness of the self is possible; two, or a series of such supplementary or split-off consciousnesses thus potentially co-existing in correlation with a single organism? It is a question of interpretation which cannot be answered by an inspection of the type of reaction but must turn upon a consideration of the whole situation involved.

If we accept the first hypothesis, that in such cases the reaction is mechanized in the sense that it is unaccompanied by mental activity in any form, it seems to throw doubt upon the whole process of inferring consciousness from behavior. If we make the second supposition, the function of introspection is invalidated as a criterion in the determination of the problem. If we assert the final alternative it undermines the unity of consciousness and makes the self of psychology a dissolving aggregation of individuals. For in the latter case there is no inherent principle of limitation in the number of so-called selves to be predicated. Any systematic form of response which has attained relative permanence in the complex of functions is sufficient to afford the basis of such a separate self. Thus in every automatic process of the body would theoretically be grounded a consciousness, narrow indeed in its content, but highly integrated and enduring. Under this hypothesis, for example, there would be spinal as well as cervical selves, and within the former field lumbar as well as cervical; for if we are to conceive disaggregation generally spinal consciousness is but a term for the series of complex mental correlates representing the various levels within that system. Man thus becomes a microcosm and represents in himself not only primitive and highly developed forms of reaction but also the correlative series of mental types from protozoan to man.

Thus we need not go beyond the phenomena which normal human experience presents in order to be confronted by the problem of the distribution of mind. It appears in every consideration of bodily activity and presents aspects as perplexing as can be found anywhere within the psychologist's field. Nevertheless it is in connection with mental types rather than mental activities that the question has chiefly been raised. With this form of the problem we have already come into contact. The phenomena of sleep and their relation to the problem of consciousness are matters, it may be said, of the type rather than of any individual bodily activity and its correlations. One may arrange a series of gradations from complete waking life with its vivid and complex mental content to profound slumber with its supposed absence of all consciousness. As one grows drowsy and passes into sleep, mental activity becomes less complicated and its content simpler. The mind slackens in alertness and its self-control is weakened. The mental content becomes disaggregated and breaks of increasing significance appear within its associative

processes. The senses are dulled, impressions grow faint and one by one disappear. Finally the sense of self is lost and consciousness vanishes in a dim awareness from which even the last discrimination of subjective and objective has disappeared.

This succession of changes points to a theoretical limit in which consciousness completely vanishes and a purely physical system of changes is presented. Not only in the natural unconsciousness of sleep but also in states artificially aroused or due to abnormal conditions, such as fainting and coma, anæsthesia from drugs and insensibility due to shock or blows, there would then be predicated a field within which no mental correlate attends the physical series of activities which continues to exist.

In these cases, of course, the condition is either exceptional or due to temporary functional relations; but in its more pronounced departures from our own the condition constitutes a characteristic type and reflects profound differences in structural organization. The beginning of this series of types is presented within the human species in two forms. The first is exceptional and consists in abnormal underdevelopment of the organism. In low-class idiots, and, in extreme degree, in anencephalous monsters the general question of the connection of physical activities with consciousness is unavoidably raised. No idiot type, perhaps, justifies a thoroughgoing application of the concept of mechanism, a reaction to stimuli unilluminated by consciousness; but the general want of intelligence, the lack of capacity to receive training, the absence of alertness, the simplicity and fixity of reactions, the rhythmical form which activity presents, not only provoke reflection in regard to the significance of any individual response as an index of consciousness, but mark the idiot as an important intermediate type between full human intelligence and a form of existence in which, from its anatomical incompleteness, consciousness must be absent if the existence of a cerebrum is to be taken as its structural basis.

In human anencephalics the organism is sensitive to a variety of sensory stimuli to which it makes adaptive responses. Food is taken and assimilated. The functions of the great organs are performed and the individual is in every way living and adaptive. But consciousness cannot be predicated even though the organism belongs to that type with which it is most typically connected; for there is an absence of that very

structural basis with which, in advancing measure, intelligence is connected throughout the whole animal series.

The second typical departure from the conditions of a complex and integrated consciousness which falls within the human limits is to be found in the earliest developmental stages of the normal individual. The mental content and its forms of integration grow more meagre as we retrace the history of the individual through childhood and infancy to the hour of birth. There the chief part of the objective system of stimuli to conscious activity disappears, so that what content exists during the later uterine period, when the formation of organs has been completed, is incomparably simpler and more vague than after birth. Retracing the process still farther the organic types which the growing organism represents become simpler and more primitive until with the disappearance of the nervous system and the reduction of the organism itself to a mass of undifferentiated cells there is dissolved the whole structural basis upon which the specific attribution of consciousness is made. Either, then, the descriptive content of the term must be given up altogether, or it must be recognized that in the course of these successive transitions there has disappeared that very phenomenon with which psychology is concerned.

Both of these series of types, that which runs through idiocy to the anencephalic condition and that which runs through infancy to the fertilized ovum, lie within the limits of the human species. The third series is that presented by the taxonomic system of living forms. This system, like the former, is characterized by a succession of increasing divergences from the human type as the scale is traversed in regard to both structure and behavior. Concerning those animal types which most closely resemble our own in anatomical features and modes of reaction our judgment is commonly unhesitating. To these, as to other men, a mental life is attributed, and interest centers only in the problem of its specific features and their relation to our own. But as the series is followed farther and the sum of differences increases on the structural as well as the functional side our interpretation hesitates. The system of changes is similar to that which appears as the ontogenetic series is retraced; and the final types with which we are confronted are identical in the two cases, that is, they are single-celled organisms which perform all the essential functions of life but without differentiated structures and in ways that must raise the question

whether there is any further value in the inference of an accompanying consciousness,—an inference which is inevitable in the case of the higher species and our fellow men.

In all these series,—taxonomic and phylogenetic, ontogenetic and functional, gradual differentiation and simplification appears, leading at last to radical unlikeness of type. In each case, therefore, the problem of definition and limitation arises and in each case it can receive only a speculative answer. In the attempt to apply this principle of discrimination one must be guided by the whole system of phenomena when no single outstanding feature can be pointed to as the specific correlate of consciousness.

The answer to this problem has been given in terms of four different concepts. The first is that of concomitance between the elementary constituents of mind and matter; the second that of the concomitance of mind with specific grades of material organization; the third that of the concomitance of mind with particular types of adaptation; and the fourth that of the concomitance of mind with certain phases of functioning.

IV

According to the first conception psycho-physical correlation is universal. Mind and matter alike are atomic. As the things of sensible experience are made up of parts and elements, so are individual minds the products of a synthesis of simpler functions and ultimately represent atomic combinations of a primitive mind-stuff. The elements of reality are arranged in pairs, or if the unit of existence be conceived monistically, each monad is at once physical and mental. Every material atom has its own atomic consciousness, each particle of mind-stuff its own body and expression. Under this conception reality is essentially dual. The universal existence of mind as the correlate of matter is posited; consciousness is diffused everywhere in reality. Its existence is a general postulate, not a particular and contingent fact whose distribution is to be determined.

One aspect of the problem is thus eliminated. The inquirer is not called upon to indicate the point at which consciousness appears in the series of organic types nor to assign limits to its occurrence, for it has none. It accompanies all physical existence and change. The essential characteristics of mind must be granted to the simplest forms of existence. Not only will all life be thus marked, but the objects of the inanimate world and its elementary particles as well must be conceived

as subjects of feeling and desire, as manifesting individual will.

Though the particular application of this conception in the interpretation of mental content presents evident difficulties, its methodical service is clear. It provides a doctrine of continuity in the interpretation of behavior. It urges the importance at every point of conceiving the simpler forms of life or of action in consistency with the more complex. It affords a way of stating the process of mental evolution by the complication of elementary activities in higher and higher processes; and conversely of treating the functions with which at any stage the psychologist has concretely to deal by resolving them into their theoretical constituents. It provides a metaphysical basis for the assumption of a psychological atomism both in immediate psychical analysis and in the interpretation of ontogenetic and phylogenetic development.

The second conception limits the distribution of psychical phenomena by assuming a specific grade of physical organization as its basis. The criterion of consciousness commonly adopted in this case is the presence of a brain in the organic system. Beneath this level as well as above it extend life and its phenomena; but in the former field its activities are conceived to occur in independence of any conscious correlate. Digestion and assimilation are there, growth and reproduction, even discriminative selection and appropriative reaction, but no consciousness. The adaptations are physiological not psychical; they are tropisms determined by physical irritation and involving only chemical syntheses and disintegrations. But above the line thus drawn the processes in question are conceived to be accompanied by consciousness. Reactions do not simply occur, they are elements in a mental life. The stimuli not only produce responses as before, but they are also sensed as they arise and, in some forms at least, are remembered after they have ceased to act.

The assumption of such a criterion definitely limits the field of consciousness and consequently marks out the bounds within which psychological inquiry may be made if the purpose of that science be, as is commonly stated, to give an account of the phenomena of consciousness and not to describe the behaviour of the various types of organisms. In tracing the outlines of that field of inquiry within which immediate introspection does not suffice, as is the case with young children, persons of diseased minds and the lower animals, the psychologist is thus guided by a specific test, namely, the

presence or absence of an encephalon. Where the organic life is conditioned by a brain its phenomena afford subject matter for psychological treatment; where the brain, or the nervous system as a whole, is lacking no interpretation in terms of subjective reality is to be made.

This conception is doubtlessly fostered by our sense of the enormous difference which separates our own conscious life from the behavior of plants and invertebrate animals. The difficulties by which we are beset when we endeavor to treat the phenomena of adaptation in these lower ranges of life in terms derived from the manifold and highly definite activities of our own conscious existence are practically insuperable. In its specific content consciousness is limited to a special field within the region of life as a whole, and the term is emptied of significance when we try to make the two co-extensive.

The division does not fall at the boundary which separates animal from vegetable. Within the former class occur forms of life which, in common sense, must be affiliated with the plant and its reactions rather than with our own conscious life. The protozoa as a group belong here, as do also the colonial metazoa, the coelenterates, the molluscs and perhaps even the worms. The differences which separate these types from the human are of course not completely represented in the absence of a brain; they penetrate the whole body and include sensory mechanisms, muscular tissues and general anatomical scheme. But if we are to single out one special feature to be employed as a criterion no other offers so available a test as the presence or absence of a brain. It is a profound characteristic the existence of which carries many implications. It marks a certain grade of development at large with relative precision. Its existence is characterized by specific forms of behavior which are absent in types lacking such an anatomical feature.

The use of the brain as a criterion of consciousness is a measure in defence of meaning. To make consciousness co-extensive with physical existence is to strip the term of all that determinate content which gives it significance when applied to our own life. To retain meaning the term must be limited in its scope, and to restrict its application to organic forms characterized by the presence of an encephalon is to select that physical structure which we find most intimately conditioning our own mental life as the test by which the presence of a life essentially similar to our own is to be determined.

On the other hand there are obvious difficulties to be encountered in the application of such a criterion. As regards behavior the world of life is not divided into two distinct groups marked by specifically different reactions, the cephalic and the non-cephalic. The development of behavior presents no evident breaks. Higher and lower groups are connected by a series of intermediate types which present relative continuity in their relations. Instead of being far withdrawn from each other, the one group passes into the other by insensible gradations. If there be grounds, as regards external organization, for the limitation of the field of consciousness, it cannot be said to have its justification in any sharp delimitation of two classes of animal behavior associated with the two organic types respectively.

Further, if regarding behavior as the objective manifestation of organization we turn to the question of structure the same lack of demarcation will be found there also. The world of life is not divided into two isolated and contrasted groups, one possessing a brain and the other lacking it. The cephalic type presents a range of variations marked by very great differences in complexity and integrity of organization between its highest and lowest members. The non-cephalic group, likewise, includes such extremes as the complete absence of nervous elements in the protozoa and the high development of the segmented type in the vermes. Moreover, the two groups are in immediate contact at their edges. No anatomical chasm separates the two, such as divides, for example, any two species separated by intermediate types. When followed downward the cephalic type is found to disappear in forms difficult to classify. Indications of a brain appear in the swelling of the foremost nerve-bulbs, but so slightly do these changes alter the essential type found in the upper grades of the group below that classification may even be said to turn upon the relations in which the type in question is conceived. One who is tracing the development of the segmented type of nervous system will see in it a non-cephalic structure; one who is following the development of the brain will find in it the progenitor of all higher cephalic forms. It is an intermediate type.

The rise of the evolutionistic point of view has given a new meaning to all such intermediate forms. These types do not, as for earlier systematists, simply obscure the problem of classification; they mark a genetic, not merely a logical, relationship among the types which they connect. Even when

breaks are found, therefore, continuity must still be assumed. The cephalic type has arisen by successive modifications from the non-cephalic, and the higher of the non-cephalic from the lower in unbroken succession. A fundamental protoplasmic continuity thus unites the highest cephalic forms with the lowest and wholly non-nervous types of organic life.

The psychological difficulty which attaches to such a division of the world of life into conscious and non-conscious groups appears in its full bearings only when one turns to the phenomena of embryonic development. Whatever may be said as to the magnitude of the differences which separate proximate forms in the evolutionary series and the significance of the mutation theory, the young of any member of the higher or cephalic group at least passes by a continuous process from the non-cephalic to the cephalic type. The earlier form of organization is not replaced by a later and disparate structure but is itself transformed into it by insensible modifications in the course of a continuous life. Here, therefore, the division becomes merely a convention which is useful in marking stages of organic development separated by differences of a certain magnitude but implies no interruption of continuity such as the distinction at first sight seems to imply.

Within this second category apparently fall various attempts to express psychical activity in terms of relational concepts derived from the physical sciences. The material phenomenon in which attention centers here is that of change or energy. One may conceive the relation as universal and interpret all physical activity in subjective terms and say that every manifestation of force is the expression of purpose and will. The distribution of mind is thus made co-extensive with that of matter, since all material existence is manifested through resistance. The distinction which is made between motion and resistance must then be within the general field of subjective experience; it cannot be a delimiting concept which makes will correlative with motion, leaving resistance outside the field of subjective phenomena. The two forms of force can only be differentiated in some such terms as offence and defence, as aggressive and self-preservative aspects of the universal psychical.

In this form the theory differs from that first described only by the modification which appears in the fundamental concept of the physical world. If mind be the correlative of all physical change,—the subjective aspect of energy—then

all material existence possesses such an aspect. No complex of substances lacks it, since all compounds must be described in terms of a system of forces; and no atom of matter can exist in separation from it, unless we say that in so far as the atom is not impinged upon its resistance is only a potentiality, the concept receiving a positive content through the conflict with other atoms. We should thus have to speak of the sleep of the atom and its awakening through the occurrence of stimulation. If the atom be defined as an hypostasis of energy and nothing more, as simply the metaphysical bearer of motion, then no such distinction would be in place. The system of subjective experience would be a thorough-going correlate of the system of energy which the physical world represents.

Within this general field various modifications of the concept in question appear. In one of these consciousness is conceived as a special form of energy, one of many, each of which has its own specific characteristics. Light is such a special form of energy and heat, electrical activity and chemical affinity. Among these appears consciousness, qualitatively unique as is each one, but of the same order as the rest. Under this conception the distribution of consciousness is limited and particularized. Energy as such does not manifest it, but energy only as it appears under special conditions and relations. One mode of motion is manifested as light, another as heat, a third as consciousness, a fourth as electricity, and so on. The appearance of consciousness is thus conditioned by the existence of certain specific forms of physical activity.

But all differences in physical processes are associated with determinate variations in structure. This conception may therefore be said to constitute a modification of that which bases the determination of consciousness upon the existence of a certain type of material organization.

In still another form of this concept consciousness is made the subjective aspect of latent energy. Under certain conditions motion disappears and is dissipated, as when a spring is released or a stone drops to the earth. In other cases motion disappears but is not dissipated. It remains available for future use and may be retransformed into kinetic energy, as when a spring is compressed or a stone reaches the highest point of its ascent when thrown upward. The capacity of a compressed spring or a lifted weight to do work is called latent energy. This condition of latency in physical energy,

according to this form of the criterion, is what we know as consciousness. Wherever latent energy appears, therefore, consciousness must be posited. It is thus made a characteristic not of nervous matter or living substance but of all grades of material organization and may appear equally in a stone and in a man,—equally, that is, in respect of its formal existence, not of its specific content. For as one condition of stress must be treated as complex and another as simple, so also must consciousness, or latent energy, present analogous modifications in composition.

V

The third criterion looks primarily to reaction but involves a reference to anatomical bases as well. Consciousness is here conceived as the concomitant of general or specific modes of response to the environment. The general forms of behavior, as well as the specific types of reaction, which characterize the different organic forms vary within very wide limits. The specific reaction-types depend for their form upon the nature of the stimuli to which the organism responds and the systemic features which condition reaction. Sense-organs and muscles provide the material basis upon which the forms of animal behavior are founded, and variations within these systems of mechanisms make very great, and in certain ways characteristic, differences in the organic type.

But to complete the description of behavior a second group of facts must be included, for behavior is a question of the uses to which the materials afforded by sensations and muscle complexes are put. The range of movements may be wide or narrow; the forms of response to a given stimulus may be highly defined or diffuse and obscure. The reaction which is called forth may be fixed or variable, simple or complex, confined to a single form of muscular adaptation or resulting in any one of the whole series which the structural plan makes possible. These differences in the general character of the response which the organism is capable of making mark the distinction between high and low grades in the scale of behavior. That reaction is superior which is highly defined, complex and variable,—in other words, which shows modification in response to characteristic differences appearing among the system of stimuli. That organism is high in the general scale of behavior which is marked by the capacity for a wide range of stimuli discriminations and of differing muscular reactions on the one hand, while on the

other its responses present refined modifications corresponding to variations in the specific conditions of reaction.

These features of the organism's adaptive response are of value not merely as means by which behavior may be characterized, but also because they may be used as a criterion of the distribution of consciousness as a concomitant of specific forms of behavior. Introspection reveals certain evident connections between these two things. Our simple, highly defined and relatively fixed reactions are accompanied by a form of consciousness which is at least commonly obscure, if consciousness can be asserted at all as their uniform concomitant. It is those experiences in which the response is complex, diffused or subject to great variation which are typically and intensely conscious. Most of all is consciousness characteristic of situations in which a definite response has not yet been established, or is not at the moment discoverable. With the progressive clarification of the situation,—that is, with the full discrimination of the system of stimuli involved—and the establishment of a more and more direct and fixed connection between the situation and its interpretation,—that is, with advance in the direction of setting up an immediate adaptive response to the stimulus—consciousness declines. In the most highly defined forms of reaction, even when such development represents an acquired modification, consciousness has ceased to be a discernible accompaniment. The type of such highly automatized responses is to be sought in the most simple and fixed forms of reaction, whether acquired or congenital, voluntary or involuntary, modifiable or unmodifiable.

If we take this series of facts as our guide we shall find ourselves recasting the conditions of consciousness in terms of the complications which appear in the form of animal behavior. A certain grade of complexity, or a certain degree of variability, in the response will now become the criterion of its presence. A variety of modifications in this concept is possible. The criterion may turn upon the inner wealth of discriminable stimuli and the complexity of the elements of possible response. The form of human consciousness is closely related to the rich manifold of stimulations to which the human body is susceptible, and to the variety of motor reactions which its structure makes possible. Where, then, the organism presents a certain range of stimulations and variety of elementary reactions we may say: here is the necessary background against which consciousness is to be pro-

jected, from the existence of which its presence is to be construed.

With the same general situation in mind, namely the inner richness of the elements of stimulation and reaction, attention may, in the next place, turn to the nature of the connections which exist between the specific classes of stimuli and the particular reactions which they prompt. In one case these connections may be in a single direction,—as when a local reflex occurs or a peristaltic movement takes place—in which case the association between stimulus and reaction will be highly definite and fixed. In another case the connection may be a multiple one, each specific stimulus being capable of calling forth not a single limited reaction but any one of the whole series, made possible by the structure of the organism. In such a case the stimulus has no fixed line of discharge. The field of its potential effect is the whole system of activities which the organism represents. It may characteristically result in a single and direct discharge, in which case it will be least conscious. (If the discharge be exclusively into the one reaction system it will theoretically be unconscious.) It may result in a discharge accompanied by diffusion of excitement over a larger area, in which case there will be a reaction accompanied by consciousness,—a reaction apprehended or intended. It may result, finally, in a general diffusion without specific reaction, the whole group of associated reaction-systems taking up the shock of the stimulus and absorbing it without localized response. What this situation presents is not, strictly speaking, the absence of all tendency to reaction but the summation of all such tendencies, which at the instant are so related that their combination produces a state of suspension,—in other words, the content in such a case is to read positively not negatively.

It is these cases which are typically suffused with consciousness. They constitute the experience of hesitation, doubt, deliberation in so far as their relation to adaptive response is concerned, and that of supplementive association, of apperception or interpretation of the situation in so far as relates to the stimulus.

This conception, it is clear, involves a reference to the structural complexity of the nervous system and cannot be isolated from the grade of organization which is thus assumed. But every criterion based upon reaction type involves the same reference, while it is, of course, true that the phenoma to which attention is directed in all these cases is

not the system of anatomical features as such but the type of behavior which it manifests. In this form of test the central element is the variability of the reaction to stimuli.

This appeal is seen in another and perhaps more complex form of behavior criterion, namely in the insistence upon progressive modification of reaction in response to changes in the system of stimuli. It is more complex because it turns to a further aspect of variability as the criterion of consciousness. The whole inner richness of stimulation and elementary reaction may be assumed and the internal diffusion of the stimulus over a wide system of elements together with the conditions of its transformation into any one of a multitude of different responses may be given, yet one may still conceive the absence of a conscious correlate. The number of the elements and the complexity of their relations are not sufficient, if variability be made the controlling idea in our conception. For even in a complex organization, such as is here imagined, equilibrium may exist in the sense that the system is capable of attaining a condition of stability in its relations. In such a case the stimulus must be conceived as taking a definite and habitual, though highly complex, course of irradiation, a given stimulus-type producing on each occasion the same wave of redistribution within the group of elements. The system of things will be complex but not necessarily varied. The organism may therefore be regarded under the conception of automatism and its reactions described in terms of purely physiological tropisms.

VI

In the face of this theoretical possibility a further phase of variability is seized upon: consciousness shall be predicated only in those cases where the whole system is subject to modification in response to progressive changes in the stimuli which act upon the organism. In other words, the capacity to learn from experience will be made the criterion of consciousness. If the learning process itself be the point to which the mind turns in this analysis the criterion will be called the modifiability of behavior; if it be the influence of experience in such modification it will be termed organic memory or the like.

The advantage of this last group of conceptions is evident. In their application the field of discussion shifts from theoretical to practical considerations, so to speak; the evidence is no longer secondary and derivative but primary and imme-

diate. That is to say, the criteria now appealed to are no longer abstract or technical, but just such as we use in our general human interpretations. The universal basis on which consciousness is popularly predicated is that of conduct or behavior, not of organization or anatomical type which, though confessedly the substrate of behavior-modes, is largely removed from direct observation and revealed only through the slow progress of descriptive science.

The starting-point of all such attribution of consciousness in connection with other organisms is our intuition of the expression of mental states by characteristic reactions in our own experience. Upon the felt identity in behavior proceeds our inference of likeness in the psychical correlate; and, far as this inference may be pushed, it is still in practical judgment dependent upon the observation or assumption of a conduct basis.

In the conception now described this characteristic is made the systematic criterion of the distribution of consciousness in the organic world. If the behavior of the type in question is essentially like our own, or at least like those simplest forms of reaction with which in our own immediate experience we know consciousness to be associated, we conceive the life of such an organic type to be characterized by a conscious correlate. The difficulty in applying this criterion lies in the function of interpretation. The complexity or variability of behavior is really an inner complication of the situation, not an immediate and obvious feature of the reaction objectively considered. A simple muscle contraction, from the point of view which must be taken here, may be a most complex act. Delay in the response to a stimulus,—the very failure to appear itself,—must often be construed positively as a real and highly developed reaction. Every response must thus be given its full and proper setting in the dramatic reconstruction of the situation under analysis; and in this synthetic representation the observer may err either by ascribing to behavior a complexity which it does not really involve or by reducing it to terms of too great simplicity. Comparative psychology has wavered between thinking the brutes human and making them automata. The popular conception of animal life undoubtedly errs by reading into its reactions a complexity which the evidence does not justify; while recent psychology has, in some cases, adopted a schematism which reduces higher forms of behavior to chains of simple and unmodifiable tropisms.

The question at issue, however, is not as to the identity in

structural formula of tropism, instinctive response and purposeful action, but of the presence or absence of variation in the inner complexity of the organism as the subject of reactions. It seems on the whole likely that we shall have to modify our conception of the simplicity of behavior in even the most elementary organisms and ascribe to them a selection and initiative, a variety and complexity of reaction for which the theory of tropisms does not make sufficient room.

The final conception, which should not perhaps be given a separate place, makes consciousness neither the necessary correlate of a certain grade of organization nor yet the uniform accompaniment of reactions of a certain complexity. It maintains, on the contrary, that there is no necessary correlation between the type of structure or function and consciousness, that the latter appears and vanishes in connection with even the highest forms of behavior. It is an evanescent phenomenon which hovers over the physiological process only during certain phases of adaptation, namely those stages in which the response is uncertain and hesitation arises as to the reaction to be made. Consciousness thus appears as the mark of imperfect adaptation. In those organic forms which are characterized by few and simple relations with the environment adaptation may reach a high degree of determinateness, and consciousness will then scarcely rise above the vanishing point. As the multiplicity of relations increases and the complexity of the conditions which each reaction represents grows greater the field of consciousness will develop. The range of reaction alternatives which a situation presents to any individual or organic type is the measure of uncertainty in its responses. When life is constituted of a succession of situations every element of which presents inner complexity, then novelty, doubt, choice, striving and reconstruction will never be absent. Consciousness under these conditions will therefore be continuous and pervasive, variations arising from the swing of its focus from point to point in the system of correlated stimuli and reactions.

While consciousness may be called self-eliminative in the sense that it is the characteristic accompaniment of those processes in which an adaptive reaction is in course of establishment through progressive selection,—the result of which is decline and eventual elimination,—its disappearance from the system of changes never actually results, since new points of friction constantly appear, thereby providing the basis of a continuous mental activity. The sources of these novel occurrences must be stated in terms of two systems of factors. The

first of these is the persistent appearance of new elements and combinations in the stimuli upon which the organism is called to react, which,—even in the case of the most highly organized habits,—call for incessant refined modifications in the form of behavior. The second set of factors is represented in what may be called the margin of attention. Adaptive activities have their roots in the organism as well as in the environment. The former construes the environment in terms of its own needs and purposes; when, therefore, any one element has been brought within its systematic group of reactions the energy represented in its assimilation does not lapse but, in the human species at least, is turned in new directions and engaged in fresh processes of interpretation and application. The establishment of any one habit, therefore, merely provides the opportunity to turn attention to some new problem of adaptation; one form of habituation gives place to another in endless succession. Adaptation thus approaches no fixed theoretical limit; the field of its future application is extended by each advance that is made. With the progressive refinement of adaptation which marks the transition to higher and higher grades of organic complexity consciousness therefore becomes more keen, pervasive and continuous.

This concept is, however, but a further modification of variability in behavior as the criterion of consciousness. It is an insistence, sharper and in greater detail than heretofore, upon the modification of reaction in all its phases and relations as the essential feature with which consciousness is to be connected. Not to be able to learn but *to be learning* marks its presence. It presents, therefore, no formal advantages or difficulties which are not found in the preceding group.

In the application of any such criterion a distinction in the content of the term 'consciousness' must be noted. In one sense it denotes the unity of functions which constitutes individual experience. Each psychical activity is a function in a personal life. Conceived in this way consciousness stands for an irreducible reality. Each particular process or function is but the unitary conscious life in this phase of its activity or in that, seen now in relation to one condition or object then in relation to another. Each activity must be interpreted in terms of its relation to this unity. It has no independent status and cannot be conceived except as a member in such an integrated system of significant relations.

But there is another way in which this same life may be treated. It is a complex of phenomena as well as a unity of functioning. The specific relations among the constituent

activities are subject to change; the particular constituents themselves vary. The formal scheme of their connections and sequences is therefore subject to incessant modifications. Every element and succession of this unitary mental life has a definite character and place in the system of phenomena as a whole, and the working out of their relations and laws constitutes a problem for descriptive or explanatory treatment.

It is this alternative point of view which determines the method of science. Its field of inquiry is uniformly conceived as a complex of phenomena whose correlations are to be worked out. Whether it be material changes or psychical events makes no difference. It is the nature and relations of the constituents, in the one system as in the other, with which science is concerned. Under this assumption the mental function must be isolated in thought and treated as though it were discrete. It is not memory as a phase of the self's activity with which psychology deals but memory as a system of phenomena having this relation to the facts of perception and that relation to the facts of reasoning. It is memory as depending upon this type of imagery in one individual or class of individuals and upon that in another. It is memory in its association with past impressions or future reactions; memory as it enters into imagination and conditions reflection; memory as it develops and declines in the course of individual history,—which the psychologist studies. The same holds true of course for every constituent of the mental life. The latter terms stands simply for this system of related elements, a system which presents a vast range of change both in its constituents and in their relations as the whole field within which the existence of mental phenomena is assumed passes in review.

When, therefore, we speak of the distribution of consciousness it is the complex of processes which we must have in mind, not the unity of functioning. The problem should properly be restated in terms of individual functions and their occurrence. The question is thus particularized. The psychologist does not ask what the distribution of consciousness as such may be, but how wide the occurrence of memory is, what the limits of abstract reasoning are, what organic forms share the life of imagination, at what level moral feeling arises, and the like.

For the formally single question as to the distribution of consciousness in the organic world is substituted a group of questions concerning the several individual functions and their appearance in the scale of life. Under this conception the

problem is not where a line shall be drawn separating the organic world into upper and lower halves, conscious and unconscious, but how we shall describe that world in terms of a series of complications giving a succession of levels in the synthesis of psychical elements and processes, such as Sentience, Constructive Perception, Recognition and Memory, Productive Imagination, Abstract Reasoning, and the like.

It is thus the concept of consciousness which undergoes modification as the scale of life is passed in review. The unity of functioning is assumed equally at all levels, whether the component activities be manifold or meagre. The simplest group of activities will mediate it. Were the functions reducible to a single process that unitary life would pervade it, and the greatest complication of its qualitative content or form of organization in no way modifies its essential unity.

We are not called upon under this conception to construe the qualitative modifications of this unity intuitionally. We may frankly confess our inability to conceive what it feels like to be a fish or an oyster, a sea-urchin or an amoeba. Our problem is the simpler one of evaluating evidence, at each successive level of physical organization and in connection with each complication of the reaction system, for the existence of individual constituents in the complex of mental activities at large.